CAR RESALE VALUE PREDICTION

Using machine learning

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**Smart Bridge - Remote Summer Internship Program**

**Abstract:**

Used car resale market in India was marked at 24.2 billion US dollars in 2019. Due to the huge requirement of used cars and lack of experts who can determine the correct valuation, there is an utmost need of bridging this gap between sellers and buyers. This project focuses on building a system that can accurately predict a resale value of the car based on minimal features like kms driven, year of purchase etc. without manual or human interference and hence it remains unbiased.

This model should consider all the crucial factors which plays a vital role in predicting the resale value of cars with maximum accuracy. To access this model we will develop a simple user interface.

**Introduction:**

Predicting the resale value of a car is not a simple task. It is trite knowledge that the value of used cars depends on a number of factors. The most important ones are usually the age of the car, its make (and model), the origin of the car (the original country of the manufacturer), its mileage (the number of kilometers it has run) and its horsepower. Due to rising fuel prices, fuel economy is also of prime importance. Unfortunately, in practice, most people do not know exactly how much fuel their car consumes for each km driven. Other factors such as the type of fuel it uses, the interior style, the braking system, acceleration, the volume of its cylinders (measured in cc), safety index, its size, number of doors, paint colour, weight of the car, consumer reviews, prestigious awards won by the car manufacturer, its physical state, whether it is a sports car, whether it has cruise control, whether it is automatic or manual transmission, whether it belonged to an individual or a company and other options such as air conditioner, sound system, power steering, cosmic wheels, GPS navigator all may influence the price as well. Some special factors which buyers attach importance in Mauritius is the local of previous owners, whether the car had been involved in serious accidents and whether it is a lady-driven car. The look and feel of the car certainly contributes a lot to the price. As we can see, the price depends on a large number of factors. Unfortunately, information about all these factors are not always available and the buyer must make the decision to purchase at a certain price based on few factors only. In this work, we have considered only a small subset of the factors mentioned above.

**Related Work:**

Surprisingly, work on estimated the price of used cars is very recent but also very sparse. In her MSc thesis [3], Listiani showed that the regression mode build using support vector machines (SVM) can estimate the residual price of leased cars with higher accuracy than simple multiple regression or multivariate regression. SVM is Predicting the Price of Used Cars using Machine Learning Techniques 755 better able to deal with very high dimensional data (number of features used to predict the price) and can avoid both over-fitting and underfitting. In particular, she used a genetic algorithm to find the optimal parameters for SVM in less time. The only drawback of this study is that the improvement of SVM regression over simple regression was not expressed in simple measures like mean deviation or variance.

In another university thesis [4], Richardson working on the hypothesis that car manufacturers are more willing to produce vehicles which do not depreciate rapidly. In particular, by using a multiple regression analysis, he showed that hybrid cars (cars which use two different power sources to propel the car, i.e. they have both an internal combustion engine and an electric motor) are more able to keep their value than traditional vehicles. This is likely due to more environmental concerns about the climate and because of its higher fuel efficiency. The importance of other factors like age, mileage, make and MPG (miles per gallon) were also considered in this study. He collected all his data from various websites.

**Methodology:**

* **Problem Understanding:** Initially first we have to spend some time on what are the problems or concerns students having during their pre admission period and we should set the solutions to those problems as objectives of this research.
* **Data Understanding:** Data should be collected from multiple sources and also consider all the factors including which will play a tiny role in student admission process.
* **Data Preparation:** Data should be cleaned that is removing the noise in the data and filling the missing values or extreme values and finalising the attributes/factors which will have crucial importance in student admission process.
* **Building Models:** several ML models have to be developed using various machine learning algorithms for admission to a particular university and the user interface has to be developed to access those models.
* **Evaluation:** Developed models are evaluated according to their accuracy scores. Once the model is finalised that model will be merged with node red for final deployment.

**Purpose:**

This resale value prediction system is made for general purpose to just predict the amount that can be roughly acquired by the user. We try to predict the amount of resale by best 70% accuracy so the user can get estimated value before he resales the car and doesn't make a deal in loss.

The main idea of making a car resale value prediction system is to get hands-on practice for python using Data Science. Car resale value prediction is the system to predict the amount of resale value based on the parameters provided by the user. User enters the details of the car into the form given and accordingly the car resale value is predicted.

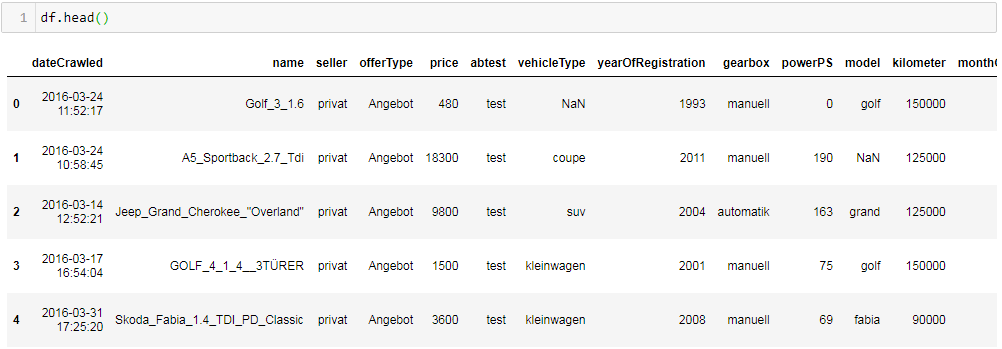
Our dataset consists of factors which effect the price of a use car

371528 rows × 20 columns

In [4]:

'dateCrawled', 'name', 'seller', 'offerType', 'price', 'abtest','vehicleType', 'yearOfRegistration', 'gearbox', 'powerPS', 'model','kilometer','monthOfRegistration', 'fuelType', 'brand','notRepairedDamage', 'dateCreated', 'nrOfPictures', 'postalCode','lastSeen’

Data source : Internet



* The objective is to explore what kind of data is provided, determine the most important factors that contribute to the price of a used car and select the most accurate model to predict the probability of price.

**Literature Survey:**

**Existing methods that can be applied on Dataset:**

There are several Machine learning algorithms to be used depending on the data you are going to process such as images, sound, text, and numerical values. The algorithms that you can choose according to the objective that you might have it may be Classification algorithms are Regression algorithms.

Example:

1.Linear Regression

2.Logistic Regression

3. Random Forest Regression / Classification.

4. Decision Tree Regression / Classification.

You will need to train the datasets to run smoothly and see an incremental improvement in the prediction rate.

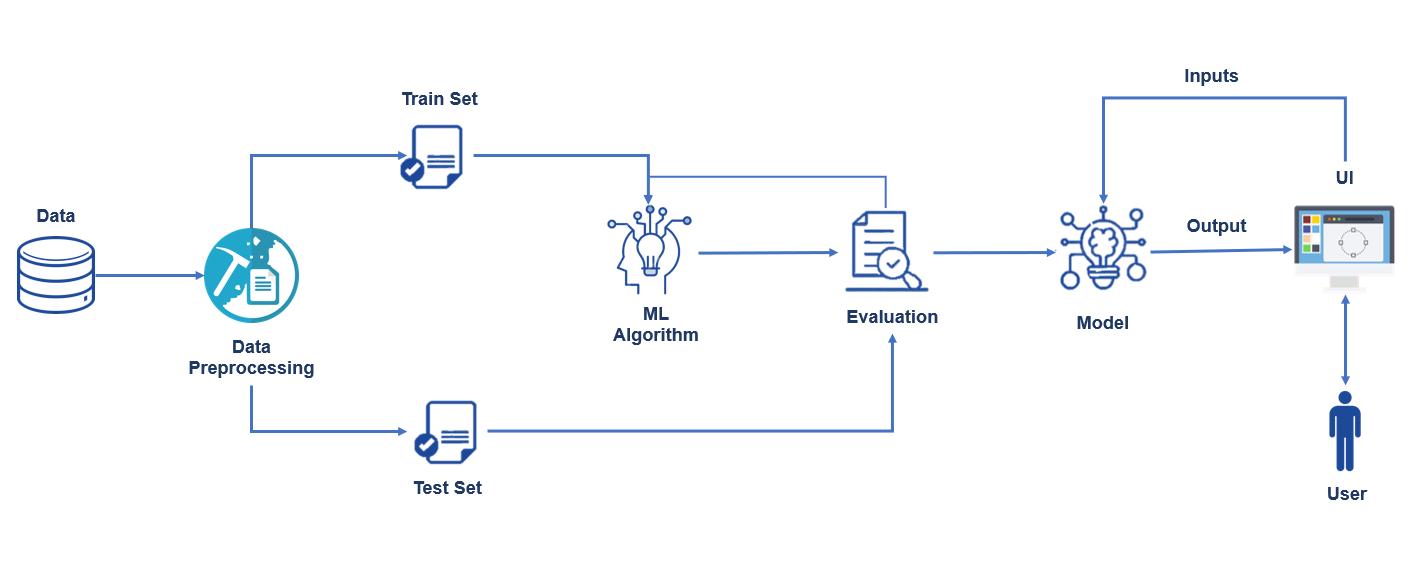
**On our Dataset, we have applied Logistic, Multilinear Regression and Random Forest , to predict the Accuracy.**

**Proposed Solution:**

In order to predict the resale value of the car, we proposed an intelligent, flexible, and effective system that is based on using regression algorithms. Considering the main factors which would affect the resale value of a vehicle a regression model is to be built that would give the nearest resale value of the vehicle. We will be using various regression algorithms and algorithm with the best accuracy will be taken as a solution, then it will be integrated to the web-based application where the user is notified with the status of his product.

**THEORITICAL ANALYSIS**

**BLOCK DIAGRAM**

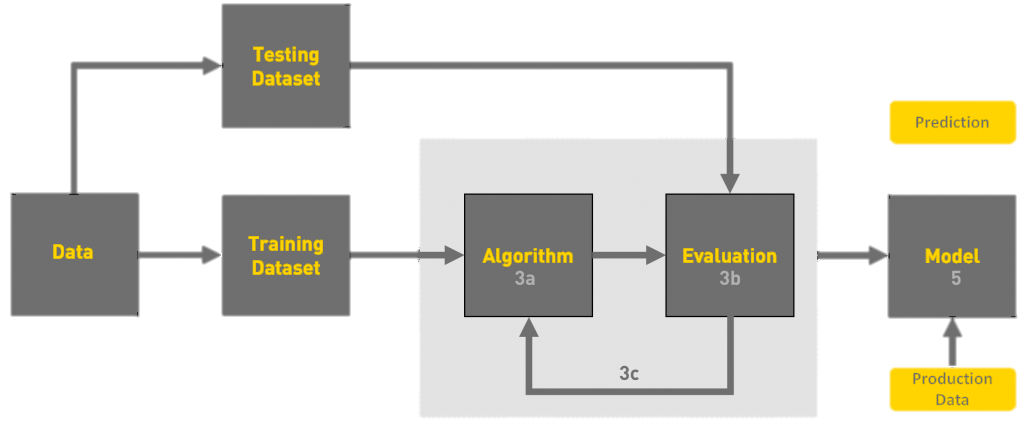


**EXPERIMENTAL INVESTIGATION:**

The data used to explore the three research questions has been provided by a leading German car manufacturer, who prefers to remain anonymous. The data contains roughly 450,000 observations that refer to actual sales of six different car models in the second-hand market. All

car models are from the same brand. Five models belong to the premium and one to the medium-class segment. The response variable is the ratio of a car’s resale price over its original list price. Stating resale prices as percentages is common practice in the literature.

**FLOW CHART:**

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**Hardware / Software designing:**

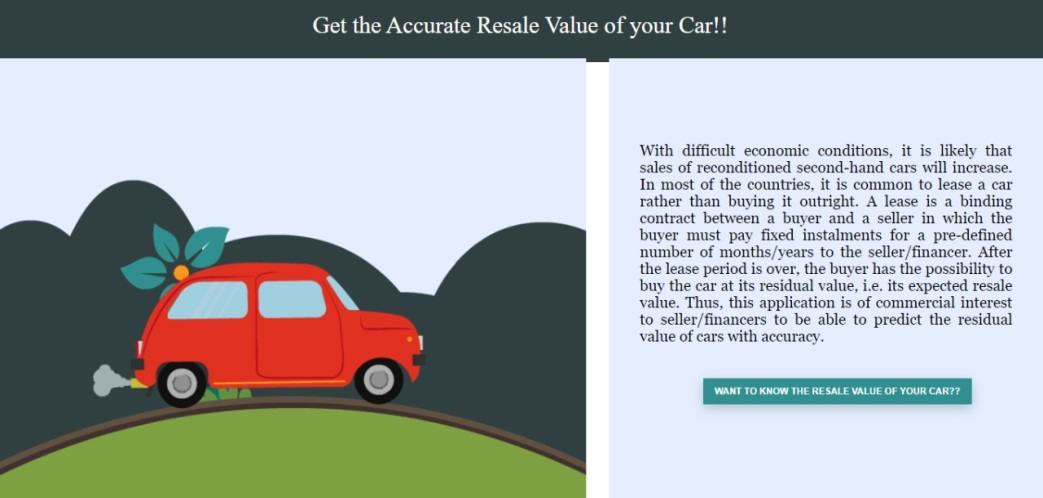
* Google colab
* Anaconda navigator
* Jupyter notebook
* Machine learning tools: pandas,

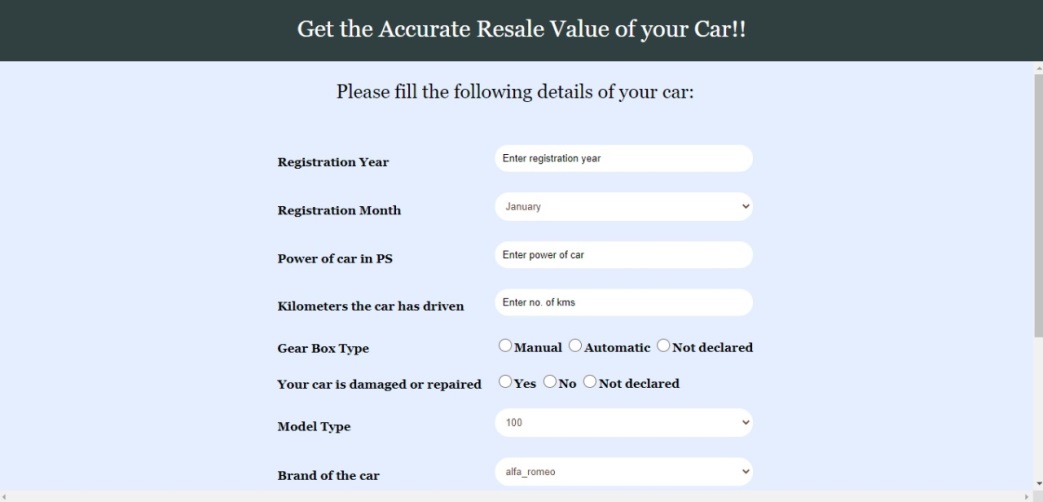
numpy,

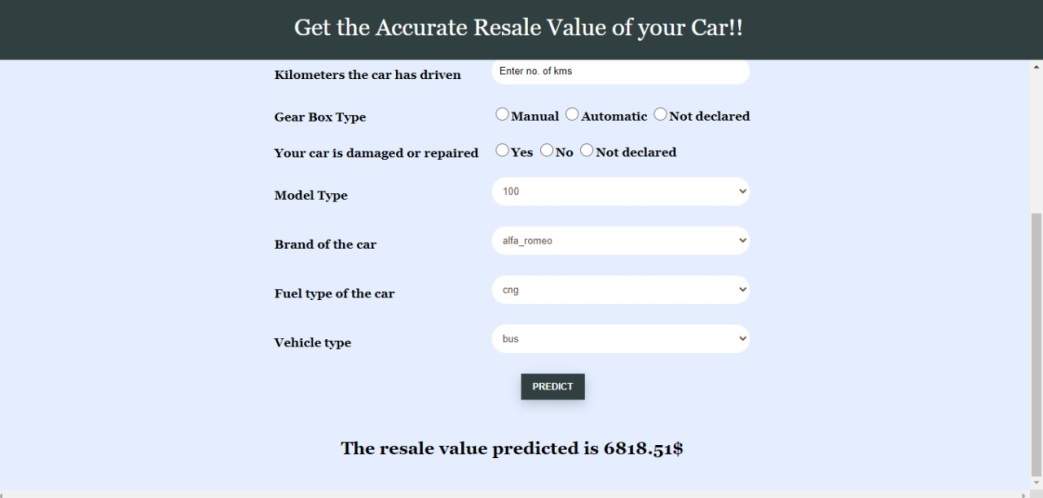
matplotlib,

scikitlearn, seaborn.

**RESULT:**

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****

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**ADVANTAGES:**

Facilitates affordability and saving for the customers buying reused cars.

Reduced rates for car insurance premiums.

Avoiding the registration fee.

**DISADVANTAGES:**

Need access.

Can not work without power.

**CONCLUSION:**

However, once more data is collected and various different cars are included in the system, deep learning-based ANN or LSTM would perform better

**FUTURE ENHANCEMENT:**

Currently, system can only deal with Swift Dzire cars due to lack of data. Also, data has been collected of only 5 cities of India. This can be extended to multiple car models and cities so as to improve accuracy and usability. Efficient use of deep learning such as LSTM (Long shortterm memory) or RNN (Recurrent Neural networks) can be implemented once enough data is collected. This can improve accuracy and decrease RMSE drastically. Currently, only few features are used to predict resale value of the car. This can be extended to more features. One can also implement CNN to determine physical condition of the car from images like identifying dents, scratches etc. and thus predicting more relevant resale value of a car.

**BIBILOGRAPHY:**

https://r.search.yahoo.com/cbclk2/dWU9MTU5QjY3MEY0RTI1NEEzQiZ1dD0xNjI2NDY0NTUxMDQxJnVvPTgyMzk0OTE1NDIyNTMxJmx0PTImcz0xJmVzPUFlMjFOQUlHUFNfNVNwLjNQYXE0UWJ2bWZwRjU4eW5oMF9uSTdzR01TcldWaVhRRQ--/RV=2/RE=1626493351/RO=10/RU=https%3a%2f%2fwww.bing.com%2faclick%3fld%3de8CfXZLNqBUnuPeSVQGyyNRzVUCUzk1nSpPV6TQu\_wy7ZFPIbuRSna2-3E2DFizQ6d7vwFaSxQJsHgotyp9CUh18fnfu\_l3iJArxb5cGojL6yPe-9Q0nMPIvR3sp5qQ2tp89J1hagxAiFXM8jTMbx9DQms2GKOHLqcg9lIqzOTHW6AOWZQ%26u%3daHR0cHMlM2ElMmYlMmZ3d3cuaXppdG8uY28uaW4lMmZ3cyUzZnElM2RyZXNhbGUlMjUyMHZhbHVlJTI1MjBjYXIlMjZhc2lkJTNkaXpfaW5fYmFfMV9jZzFfMDElMjZkZSUzZGMlMjZhYyUzZDIwNTIlMjZjaWQlM2QzMjY4NjExODclMjZhaWQlM2QxMzE4MzE1MTg2OTMzMTU3JTI2a2lkJTNka3dkLTgyMzk0ODcwOTcxODI3JTNhYXVkLTgwNTY3MzE5MyUzYWxvYy05MCUyNmxvY2FsZSUzZGVuX0lOJTI2bXNjbGtpZCUzZDkyZjY5ODM1MmQ2YzFmMTcyMTZjZjhjNGNjNGI3NzI1%26rlid%3d92f698352d6c1f17216cf8c4cc4b7725/RK=2/RS=5rxKO5NOMe6cTVeybMhQDSzz3KE-;\_ylt=AwrPhSom4fFgdz0AGgC7HAx.;\_ylu=Y29sbwNzZzMEcG9zAzEEdnRpZAMEc2VjA292LXRvcA--;\_ylc=X3IDMgRydAMw?IG=0acf852a40d74ed180000000001d309c

**APPENDIX:**

**Homepage: resaleintro.html**

<html>

<head>

<title>Resale Value Prediction</title>

<style>

.header {

top:0px;

margin:0px;

left: 0px;

right: 0px;

position: fixed;

background: #304040;

color: white;

overflow: hidden;

padding-bottom: 30px;

font-size: 2.25vw;

width: 100%;

padding-left:0px;

text-align: center;

padding-top:20px;

}

.second{

top:80px;

bottom:0px;

margin:0px;

left: 0px;

right: 0%;

position: fixed;

padding: 0px;

width: 100%;

background-image:url({{url\_for('static',filename='images/car\_03.gif')}});

background-repeat:no-repeat;

background-size: contain;

}

.inside{

top:80px;

bottom:0px;

margin:0px;

left: 58.5%;

right: 0%;

position: fixed;

padding-left: 40px;

padding-top:8%;

padding-right:40px;

background-color:#E4EEFF;

font-family:Georgia, serif;

color:black;

font-size:20px;

text-align:justify;

}

.myButton{

border: none;

text-align: center;

cursor: pointer;

text-transform: uppercase;

outline: none;

overflow: hidden;

color: #fff;

font-weight: 700;

font-size: 12px;

background-color: #309090;

padding: 10px 15px;

margin: 0 auto;

box-shadow: 0 5px 15px rgba(0,0,0,0.20);

}

</style>

</head>

<body>

<div class="header">GET THE ACCURATE RESALE VALUE OF YOUR CAR!!</div>

<div class="second">

<div class="inside">With difficult economic conditions, it is likely that sales of reconditioned second-hand cars will increase. In most of the countries, it is common to lease a car rather than buying it outright. A lease is a binding contract between a buyer and a seller in which the buyer must pay fixed instalments for a pre-defined number of months/years to the seller/financer. After the lease period is over, the buyer has the possibility to buy the car at its residual value, i.e. its expected resale value. Thus, this application is of commercial interest to seller/financers to be able to predict the residual value of cars with accuracy.

<br><br><br>

<div style="margin-left:17%">

<a href="{{url\_for('predict')}}"><button type="button" class="myButton" >Want to know the resale value of your car??</button></a>

</div>

</div>

</div>

</body>

</html>

**Nextpage: resalevalue.html**

<html>

<title >Car resale value prediction</title>

<head>

<link rel="stylesheet" type="text/css" href="{{ url\_for('static', filename = 'style/resale1.css') }}">

<!link rel="stylesheet" type="text/css" href="resale1.css">

</head>

<body class="body1" >

<form method="POST">

<div class="container">

<h1 align = 'center' style="color:black; font-size:50px" >Get the accurate resale value of your car!!</h1>

<p align = 'center'style="font-size:25px">Please fill the following details of your car:</p>

<form action='/age' method="post">

<table align='center' style='padding:15px; border-spacing: 15px; font-size:20 px'>

<tr>

<td><label for="regyear"><b>Registration Year</b></label></td>

<td><input type="text" placeholder="Enter registration year" name="regyear" id="rcorners1" required></td>

</tr>

<tr>

<td><label for="regmonth" ><b>Registration Month</b></label></td>

<td><select name="regmonth" required>

<option value = "0" > January </option>

<option value = "1" > February </option>

<option value = "2" > March </option>

<option value = "3" > April </option>

<option value = "4" > May </option>

<option value = "5" > June </option>

<option value = "6" > July </option>

<option value = "7" > August </option>

<option value = "8" > September </option>

<option value = "9" > October </option>

<option value = "10" > November </option>

<option value = "11" > December </option>

</select>

</td>

</tr>

<tr>

<td><label for="powerps"><b>Power of car in PS</b></label></td>

<td><input type="text" placeholder="Enter power of car" name="powerps" id="rcorners1" required></td>

</tr>

<tr>

<td><label for="kms"><b>Kilometers the car has driven</b></label></td>

<td><input type="text" placeholder="Enter no. of kms" name="kms" id="rcorners1" required></td>

</tr>

<tr>

<td><label for="gearbox"><b>Gear Box Type</b></label></td>

<td style = "vertical-align:middle"><input type="radio" class="radion" name="gearbox" value="manual" required><b>Manual</b>

<input type="radio" class="radion" name="gearbox" value="automatic" ><b>Automatic</b>

<input type="radio" class="radion" name="gearbox" value="not-declared" ><b>Not declared</b></td>

</tr>

<tr>

<td><label for="dam"><b>Your car is damaged or repaired</b></label></td>

<td style = "vertical-align:middle"><input type="radio" class="radion" name="dam" value="Yes" required><b>Yes</b>

<input type="radio" class="radion" name="dam" value="No" ><b>No</b>

<input type="radio" class="radion" name="dam" value="not-declared" ><b>Not declared</b></td>

</tr>

<tr>

<td>

<label for="modeltype" ><b>Model Type</b></label>

</td>

<td>

<select name="modeltype" required>

<option value = "100" > 100 </option>

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<option value = "156" > 156 </option>

<option value = "159" > 159 </option>

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<option value = "aygo" > aygo </option>

<option value = "b\_klasse" > b\_klasse </option>

<option value = "b\_max" > b\_max </option>

<option value = "beetle" > beetle </option>

<option value = "berlingo" > berlingo </option>

<option value = "bora" > bora </option>

<option value = "boxster" > boxster </option>

<option value = "bravo" > bravo </option>

<option value = "c1" > c1 </option>

<option value = "c2" > c2 </option>

<option value = "c3" > c3 </option>

<option value = "c4" > c4 </option>

<option value = "c5" > c5 </option>

<option value = "c\_klasse" > c\_klasse </option>

<option value = "c\_max" > c\_max </option>

<option value = "c\_reihe" > c\_reihe </option>

<option value = "caddy" > caddy </option>

<option value = "calibra" > calibra </option>

<option value = "captiva" > captiva </option>

<option value = "carisma" > carisma </option>

<option value = "carnival" > carnival </option>

<option value = "cayenne" > cayenne </option>

<option value = "cc" > cc </option>

<option value = "ceed" > ceed </option>

<option value = "charade" > charade </option>

<option value = "cherokee" > cherokee </option>

<option value = "citigo" > citigo </option>

<option value = "civic" > civic </option>

<option value = "cl" > cl </option>

<option value = "clio" > clio </option>

<option value = "clk" > clk </option>

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<option value = "colt" > colt </option>

<option value = "combo" > combo </option>

<option value = "cooper" > cooper </option>

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<option value = "eos" > eos </option>

<option value = "escort" > escort </option>

<option value = "espace" > espace </option>

<option value = "exeo" > exeo </option>

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<option value = "focus" > focus </option>

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<option value = "insignia" > insignia </option>

<option value = "jazz" > jazz </option>

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<option value = "jimny" > jimny </option>

<option value = "juke" > juke </option>

<option value = "justy" > justy </option>

<option value = "ka" > ka </option>

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<option value = "m\_reihe" > m\_reihe </option>

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<option value = "niva" > niva </option>

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<option value = "note" > note </option>

<option value = "nubira" > nubira </option>

<option value = "octavia" > octavia </option>

<option value = "omega" > omega </option>

<option value = "one" > one </option>

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<option value = "picanto" > picanto </option>

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<option value = "primera" > primera </option>

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<option value = "punto" > punto </option>

<option value = "q3" > q3 </option>

<option value = "q5" > q5 </option>

<option value = "q7" > q7 </option>

<option value = "qashqai" > qashqai </option>

<option value = "r19" > r19 </option>

<option value = "range\_rover" > range\_rover </option>

<option value = "range\_rover\_evoque" > range\_rover\_evoque </option>

<option value = "range\_rover\_sport" > range\_rover\_sport </option>

<option value = "rangerover" > rangerover </option>

<option value = "rav" > rav </option>

<option value = "rio" > rio </option>

<option value = "roadster" > roadster </option>

<option value = "roomster" > roomster </option>

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<option value = "s\_max" > s\_max </option>

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<option value = "santa" > santa </option>

<option value = "scenic" > scenic </option>

<option value = "scirocco" > scirocco </option>

<option value = "seicento" > seicento </option>

<option value = "serie\_2" > serie\_2 </option>

<option value = "serie\_3" > serie\_3 </option>

<option value = "sharan" > sharan </option>

<option value = "signum" > signum </option>

<option value = "sirion" > sirion </option>

<option value = "sl" > sl </option>

<option value = "slk" > slk </option>

<option value = "sorento" > sorento </option>

<option value = "spark" > spark </option>

<option value = "spider" > spider </option>

<option value = "sportage" > sportage </option>

<option value = "sprinter" > sprinter </option>

<option value = "stilo" > stilo </option>

<option value = "superb" > superb </option>

<option value = "swift" > swift </option>

<option value = "terios" > terios </option>

<option value = "tigra" > tigra </option>

<option value = "tiguan" > tiguan </option>

<option value = "toledo" > toledo </option>

<option value = "touareg" > touareg </option>

<option value = "touran" > touran </option>

<option value = "transit" > transit </option>

<option value = "transporter" > transporter </option>

<option value = "tt" > tt </option>

<option value = "tucson" > tucson </option>

<option value = "twingo" > twingo </option>

<option value = "up" > up </option>

<option value = "v40" > v40 </option>

<option value = "v50" > v50 </option>

<option value = "v60" > v60 </option>

<option value = "v70" > v70 </option>

<option value = "v\_klasse" > v\_klasse </option>

<option value = "vectra" > vectra </option>

<option value = "verso" > verso </option>

<option value = "viano" > viano </option>

<option value = "vito" > vito </option>

<option value = "vivaro" > vivaro </option>

<option value = "voyager" > voyager </option>

<option value = "wrangler" > wrangler </option>

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<option value = "x\_trail" > x\_trail </option>

<option value = "x\_type" > x\_type </option>

<option value = "xc\_reihe" > xc\_reihe </option>

<option value = "yaris" > yaris </option>

<option value = "yeti" > yeti </option>

<option value = "ypsilon" > ypsilon </option>

<option value = "z\_reihe" > z\_reihe </option>

<option value = "zafira" > zafira </option>

</select>

</td>

</tr>

<tr>

<td><label for="brand" ><b>Brand of the car</b></label>

</td>

<td>

<select name="brand" required>

<option value = "alfa\_romeo" > alfa\_romeo </option>

<option value = "audi" > audi </option>

<option value = "bmw" > bmw </option>

<option value = "chevrolet" > chevrolet </option>

<option value = "chrysler" > chrysler </option>

<option value = "citroen" > citroen </option>

<option value = "dacia" > dacia </option>

<option value = "daewoo" > daewoo </option>

<option value = "daihatsu" > daihatsu </option>

<option value = "fiat" > fiat </option>

<option value = "ford" > ford </option>

<option value = "honda" > honda </option>

<option value = "hyundai" > hyundai </option>

<option value = "jaguar" > jaguar </option>

<option value = "jeep" > jeep </option>

<option value = "kia" > kia </option>

<option value = "lada" > lada </option>

<option value = "lancia" > lancia </option>

<option value = "land\_rover" > land\_rover </option>

<option value = "mazda" > mazda </option>

<option value = "mercedes\_benz" > mercedes\_benz </option>

<option value = "mini" > mini </option>

<option value = "mitsubishi" > mitsubishi </option>

<option value = "nissan" > nissan </option>

<option value = "opel" > opel </option>

<option value = "peugeot" > peugeot </option>

<option value = "porsche" > porsche </option>

<option value = "renault" > renault </option>

<option value = "rover" > rover </option>

<option value = "saab" > saab </option>

<option value = "seat" > seat </option>

<option value = "skoda" > skoda </option>

<option value = "smart" > smart </option>

<option value = "sonstige\_autos" > sonstige\_autos </option>

<option value = "subaru" > subaru </option>

<option value = "suzuki" > suzuki </option>

<option value = "toyota" > toyota </option>

<option value = "trabant" > trabant </option>

<option value = "volkswagen" > volkswagen </option>

<option value = "volvo" > volvo </option>

</select>

</td>

</tr>

<tr>

<td><label for="fuel" ><b>Fuel type of the car</b></label>

</td>

<td>

<select name="fuel" required>

<option value = "cng" > cng </option>

<option value = "diesel" > diesel </option>

<option value = "electric" > electric </option>

<option value = "hybrid" > hybrid </option>

<option value = "lpg" > lpg </option>

<option value = "not-declared" > not-declared </option>

<option value = "others" > others </option>

<option value = "petrol" > petrol </option>

</select>

</td>

</tr>

<tr>

<td><label for="vehicletype" ><b>Vehicle type</b></label>

</td>

<td>

<select name="vehicletype" required>

<option value= "bus" > bus </option>

<option value= "combination" > combination </option>

<option value= "convertible" > convertible </option>

<option value= "coupe" > coupe </option>

<option value= "limousine" > limousine </option>

<option value= "not-declared" > not-declared </option>

<option value= "others" > others </option>

<option value= "small" > small </option>

<option value= "car" > car </option>

<option value= "suv" > suv </option>

</select>

</td>

</tr>

<tr>

<td colspan="2" align="center" ><button class="button5" type="submit" name="predict" align='center' value="Predict" onclick="window.location.href = 'F:\Projects\Abalone\templates\abalone\_predict1.html'" >Predict</button></td>

</tr>

</table>

</form>

<table align="center">

<tr>

<td><label for="age" style="font-size:23px"><b>Predicted Age is</b></label></td>

<td style="font-size:23px"><b>{{ypred}} years</b></td>

</tr>

</table>

</div>

</form>

**Nextpage: resalepredict.html**

<html>

<head>

<title>RESALE VALUE PREDICTION</title>

<style>

.header {

top:0px;

margin:0px;

left: 0px;

right: 0px;

position: fixed;

background: #304040;

color: white;

overflow: hidden;

padding-bottom: 30px;

font-size: 2.25vw;

width: 100%;

padding-left:0px;

text-align: center;

padding-top:20px;

}

.second{

top:80px;

bottom:0px;

margin:0px;

left: 0px;

right: 0px;

position: fixed;

padding: 0px;

width: 100%;

background-color:#E4EEFF;

overflow: scroll;

}

.inside{

top:80px;

bottom:0px;

margin:0px;

left: 55%;

right: 0%;

position: fixed;

padding-left: 40px;

padding-top:8%;

padding-right:40px;

background-color:#F2D19A;

font-family:Georgia, serif;

color:black;

font-size:20px;

text-align:justify;

}

.myButton{

border: none;

text-align: center;

cursor: pointer;

text-transform: uppercase;

outline: none;

overflow: hidden;

color: #fff;

font-weight: 700;

font-size: 12px;

background-color: #304040;

padding: 10px 15px;

margin: 0 auto;

box-shadow: 0 5px 15px rgba(0,0,0,0.20);

margin-left:17%;

}

input {

width:100%;

margin-bottom: 10px;

background: white;

outline: none;

padding: 10px;

font-size: 13px;

color: black;

text-shadow: white;

border: 10px #304040;

border-radius: 40px;

box-shadow: white;

}

select {

width:100%;

margin-bottom: 10px;

background: white;

border: none;

outline: none;

padding: 10px;

font-size: 13px;

color: #6c493a;

text-shadow: white;

border: #6c493a;

border-radius: 40px;

box-shadow: white;

}

::placeholder {

color: black;

opacity: 1;

}

.radion {

border:2px solid black;

border-color:black;

height:17px;

width:17px;

}

input:focus { box-shadow: inset 0 -5px 45px rgba(100,100,100,0.4), 0 1px 1px rgba(255,255,255,0.2); }

</style>

</head>

<body style="font-family:Georgia, serif; ">

<div class="header">Get the Accurate Resale Value of your Car!!</div>

<div class="second">

<p align = 'center'style="font-size:25px">Please fill the following details of your car:</p>

<form action="{{ url\_for('y\_predict')}}"method="post">

<table align='center' style='padding:15px; border-spacing: 15px; font-size:20 px'>

<tr>

<td><label for="regyear"><b>Registration Year</b></label></td>

<td><input type="text" placeholder="Enter registration year" name="regyear" id="rcorners1" required></td>

</tr>

<tr>

<td><label for="regmonth" ><b>Registration Month</b></label></td>

<td><select name="regmonth" required>

<option value = "0" > January </option>

<option value = "1" > February </option>

<option value = "2" > March </option>

<option value = "3" > April </option>

<option value = "4" > May </option>

<option value = "5" > June </option>

<option value = "6" > July </option>

<option value = "7" > August </option>

<option value = "8" > September </option>

<option value = "9" > October </option>

<option value = "10" > November </option>

<option value = "11" > December </option>

</select>

</td>

</tr>

<tr>

<td><label for="powerps"><b>Power of car in PS</b></label></td>

<td><input type="text" placeholder="Enter power of car" name="powerps" id="rcorners1" required></td>

</tr>

<tr>

<td><label for="kms"><b>Kilometers the car has driven</b></label></td>

<td><input type="text" placeholder="Enter no. of kms" name="kms" id="rcorners1" required></td>

</tr>

<tr>

<td><label for="gearbox"><b>Gear Box Type</b></label></td>

<td style = "vertical-align:middle"><input type="radio" class="radion" name="gearbox" value="manual" required><b>Manual</b>

<input type="radio" class="radion" name="gearbox" value="automatic" ><b>Automatic</b>

<input type="radio" class="radion" name="gearbox" value="not-declared" ><b>Not declared</b></td>

</tr>

<tr>

<td><label for="dam"><b>Your car is damaged or repaired</b></label></td>

<td style = "vertical-align:middle"><input type="radio" class="radion" name="dam" value="Yes" required><b>Yes</b>

<input type="radio" class="radion" name="dam" value="No" ><b>No</b>

<input type="radio" class="radion" name="dam" value="not-declared" ><b>Not declared</b></td>

</tr>

<tr>

<td>

<label for="modeltype" ><b>Model Type</b></label>

</td>

<td>

<select name="modeltype" required>

<option value = "100" > 100 </option>

<option value = "145" > 145 </option>

<option value = "147" > 147 </option>

<option value = "156" > 156 </option>

<option value = "159" > 159 </option>

<option value = "1\_reihe" > 1\_reihe </option>

<option value = "1er" > 1er </option>

<option value = "200" > 200 </option>

<option value = "2\_reihe" > 2\_reihe </option>

<option value = "300c" > 300c </option>

<option value = "3\_reihe" > 3\_reihe </option>

<option value = "3er" > 3er </option>

<option value = "4\_reihe" > 4\_reihe </option>

<option value = "500" > 500 </option>

<option value = "5\_reihe" > 5\_reihe </option>

<option value = "5er" > 5er </option>

<option value = "601" > 601 </option>

<option value = "6\_reihe" > 6\_reihe </option>

<option value = "6er" > 6er </option>

<option value = "7er" > 7er </option>

<option value = "80" > 80 </option>

<option value = "850" > 850 </option>

<option value = "90" > 90 </option>

<option value = "900" > 900 </option>

<option value = "9000" > 9000 </option>

<option value = "911" > 911 </option>

<option value = "a1" > a1 </option>

<option value = "a2" > a2 </option>

<option value = "a3" > a3 </option>

<option value = "a4" > a4 </option>

<option value = "a5" > a5 </option>

<option value = "a6" > a6 </option>

<option value = "a8" > a8 </option>

<option value = "a\_klasse" > a\_klasse </option>

<option value = "accord" > accord </option>

<option value = "agila" > agila </option>

<option value = "alhambra" > alhambra </option>

<option value = "almera" > almera </option>

<option value = "altea" > altea </option>

<option value = "amarok" > amarok </option>

<option value = "andere" > andere </option>

<option value = "antara" > antara </option>

<option value = "arosa" > arosa </option>

<option value = "astra" > astra </option>

<option value = "auris" > auris </option>

<option value = "avensis" > avensis </option>

<option value = "aveo" > aveo </option>

<option value = "aygo" > aygo </option>

<option value = "b\_klasse" > b\_klasse </option>

<option value = "b\_max" > b\_max </option>

<option value = "beetle" > beetle </option>

<option value = "berlingo" > berlingo </option>

<option value = "bora" > bora </option>

<option value = "boxster" > boxster </option>

<option value = "bravo" > bravo </option>

<option value = "c1" > c1 </option>

<option value = "c2" > c2 </option>

<option value = "c3" > c3 </option>

<option value = "c4" > c4 </option>

<option value = "c5" > c5 </option>

<option value = "c\_klasse" > c\_klasse </option>

<option value = "c\_max" > c\_max </option>

<option value = "c\_reihe" > c\_reihe </option>

<option value = "caddy" > caddy </option>

<option value = "calibra" > calibra </option>

<option value = "captiva" > captiva </option>

<option value = "carisma" > carisma </option>

<option value = "carnival" > carnival </option>

<option value = "cayenne" > cayenne </option>

<option value = "cc" > cc </option>

<option value = "ceed" > ceed </option>

<option value = "charade" > charade </option>

<option value = "cherokee" > cherokee </option>

<option value = "citigo" > citigo </option>

<option value = "civic" > civic </option>

<option value = "cl" > cl </option>

<option value = "clio" > clio </option>

<option value = "clk" > clk </option>

<option value = "clubman" > clubman </option>

<option value = "colt" > colt </option>

<option value = "combo" > combo </option>

<option value = "cooper" > cooper </option>

<option value = "cordoba" > cordoba </option>

<option value = "corolla" > corolla </option>

<option value = "corsa" > corsa </option>

<option value = "cr\_reihe" > cr\_reihe </option>

<option value = "croma" > croma </option>

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<option value = "cuore" > cuore </option>

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<option value = "discovery\_sport" > discovery\_sport </option>

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<option value = "elefantino" > elefantino </option>

<option value = "eos" > eos </option>

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<option value = "espace" > espace </option>

<option value = "exeo" > exeo </option>

<option value = "fabia" > fabia </option>

<option value = "fiesta" > fiesta </option>

<option value = "focus" > focus </option>

<option value = "forester" > forester </option>

<option value = "forfour" > forfour </option>

<option value = "fortwo" > fortwo </option>

<option value = "fox" > fox </option>

<option value = "freelander" > freelander </option>

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<option value = "galaxy" > galaxy </option>

<option value = "getz" > getz </option>

<option value = "gl" > gl </option>

<option value = "glk" > glk </option>

<option value = "golf" > golf </option>

<option value = "grand" > grand </option>

<option value = "i3" > i3 </option>

<option value = "i\_reihe" > i\_reihe </option>

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<option value = "insignia" > insignia </option>

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<option value = "jetta" > jetta </option>

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<option value = "lanos" > lanos </option>

<option value = "legacy" > legacy </option>

<option value = "leon" > leon </option>

<option value = "lodgy" > lodgy </option>

<option value = "logan" > logan </option>

<option value = "lupo" > lupo </option>

<option value = "lybra" > lybra </option>

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<option value = "m\_reihe" > m\_reihe </option>

<option value = "materia" > materia </option>

<option value = "matiz" > matiz </option>

<option value = "megane" > megane </option>

<option value = "meriva" > meriva </option>

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<option value = "modus" > modus </option>

<option value = "mondeo" > mondeo </option>

<option value = "move" > move </option>

<option value = "musa" > musa </option>

<option value = "mustang" > mustang </option>

<option value = "mx\_reihe" > mx\_reihe </option>

<option value = "navara" > navara </option>

<option value = "niva" > niva </option>

<option value = "not-declared" > not-declared </option>

<option value = "note" > note </option>

<option value = "nubira" > nubira </option>

<option value = "octavia" > octavia </option>

<option value = "omega" > omega </option>

<option value = "one" > one </option>

<option value = "outlander" > outlander </option>

<option value = "pajero" > pajero </option>

<option value = "panda" > panda </option>

<option value = "passat" > passat </option>

<option value = "phaeton" > phaeton </option>

<option value = "picanto" > picanto </option>

<option value = "polo" > polo </option>

<option value = "primera" > primera </option>

<option value = "ptcruiser" > ptcruiser </option>

<option value = "punto" > punto </option>

<option value = "q3" > q3 </option>

<option value = "q5" > q5 </option>

<option value = "q7" > q7 </option>

<option value = "qashqai" > qashqai </option>

<option value = "r19" > r19 </option>

<option value = "range\_rover" > range\_rover </option>

<option value = "range\_rover\_evoque" > range\_rover\_evoque </option>

<option value = "range\_rover\_sport" > range\_rover\_sport </option>

<option value = "rangerover" > rangerover </option>

<option value = "rav" > rav </option>

<option value = "rio" > rio </option>

<option value = "roadster" > roadster </option>

<option value = "roomster" > roomster </option>

<option value = "rx\_reihe" > rx\_reihe </option>

<option value = "s60" > s60 </option>

<option value = "s\_klasse" > s\_klasse </option>

<option value = "s\_max" > s\_max </option>

<option value = "s\_type" > s\_type </option>

<option value = "samara" > samara </option>

<option value = "sandero" > sandero </option>

<option value = "santa" > santa </option>

<option value = "scenic" > scenic </option>

<option value = "scirocco" > scirocco </option>

<option value = "seicento" > seicento </option>

<option value = "serie\_2" > serie\_2 </option>

<option value = "serie\_3" > serie\_3 </option>

<option value = "sharan" > sharan </option>

<option value = "signum" > signum </option>

<option value = "sirion" > sirion </option>

<option value = "sl" > sl </option>

<option value = "slk" > slk </option>

<option value = "sorento" > sorento </option>

<option value = "spark" > spark </option>

<option value = "spider" > spider </option>

<option value = "sportage" > sportage </option>

<option value = "sprinter" > sprinter </option>

<option value = "stilo" > stilo </option>

<option value = "superb" > superb </option>

<option value = "swift" > swift </option>

<option value = "terios" > terios </option>

<option value = "tigra" > tigra </option>

<option value = "tiguan" > tiguan </option>

<option value = "toledo" > toledo </option>

<option value = "touareg" > touareg </option>

<option value = "touran" > touran </option>

<option value = "transit" > transit </option>

<option value = "transporter" > transporter </option>

<option value = "tt" > tt </option>

<option value = "tucson" > tucson </option>

<option value = "twingo" > twingo </option>

<option value = "up" > up </option>

<option value = "v40" > v40 </option>

<option value = "v50" > v50 </option>

<option value = "v60" > v60 </option>

<option value = "v70" > v70 </option>

<option value = "v\_klasse" > v\_klasse </option>

<option value = "vectra" > vectra </option>

<option value = "verso" > verso </option>

<option value = "viano" > viano </option>

<option value = "vito" > vito </option>

<option value = "vivaro" > vivaro </option>

<option value = "voyager" > voyager </option>

<option value = "wrangler" > wrangler </option>

<option value = "x\_reihe" > x\_reihe </option>

<option value = "x\_trail" > x\_trail </option>

<option value = "x\_type" > x\_type </option>

<option value = "xc\_reihe" > xc\_reihe </option>

<option value = "yaris" > yaris </option>

<option value = "yeti" > yeti </option>

<option value = "ypsilon" > ypsilon </option>

<option value = "z\_reihe" > z\_reihe </option>

<option value = "zafira" > zafira </option>

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<tr>

<td><label for="brand" ><b>Brand of the car</b></label>

</td>

<td>

<select name="brand" required>

<option value = "alfa\_romeo" > alfa\_romeo </option>

<option value = "audi" > audi </option>

<option value = "bmw" > bmw </option>

<option value = "chevrolet" > chevrolet </option>

<option value = "chrysler" > chrysler </option>

<option value = "citroen" > citroen </option>

<option value = "dacia" > dacia </option>

<option value = "daewoo" > daewoo </option>

<option value = "daihatsu" > daihatsu </option>

<option value = "fiat" > fiat </option>

<option value = "ford" > ford </option>

<option value = "honda" > honda </option>

<option value = "hyundai" > hyundai </option>

<option value = "jaguar" > jaguar </option>

<option value = "jeep" > jeep </option>

<option value = "kia" > kia </option>

<option value = "lada" > lada </option>

<option value = "lancia" > lancia </option>

<option value = "land\_rover" > land\_rover </option>

<option value = "mazda" > mazda </option>

<option value = "mercedes\_benz" > mercedes\_benz </option>

<option value = "mini" > mini </option>

<option value = "mitsubishi" > mitsubishi </option>

<option value = "nissan" > nissan </option>

<option value = "opel" > opel </option>

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<option value = "porsche" > porsche </option>

<option value = "renault" > renault </option>

<option value = "rover" > rover </option>

<option value = "saab" > saab </option>

<option value = "seat" > seat </option>

<option value = "skoda" > skoda </option>

<option value = "smart" > smart </option>

<option value = "sonstige\_autos" > sonstige\_autos </option>

<option value = "subaru" > subaru </option>

<option value = "suzuki" > suzuki </option>

<option value = "toyota" > toyota </option>

<option value = "trabant" > trabant </option>

<option value = "volkswagen" > volkswagen </option>

<option value = "volvo" > volvo </option>

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<tr>

<td><label for="fuel" ><b>Fuel type of the car</b></label>

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<option value = "cng" > cng </option>

<option value = "diesel" > diesel </option>

<option value = "electric" > electric </option>

<option value = "hybrid" > hybrid </option>

<option value = "lpg" > lpg </option>

<option value = "not-declared" > not-declared </option>

<option value = "others" > others </option>

<option value = "petrol" > petrol </option>

</select>

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</tr>

<tr>

<td><label for="vehicletype" ><b>Vehicle type</b></label>

</td>

<td>

<select name="vehicletype" required>

<option value= "bus" > bus </option>

<option value= "combination" > combination </option>

<option value= "convertible" > convertible </option>

<option value= "coupe" > coupe </option>

<option value= "limousine" > limousine </option>

<option value= "not-declared" > not-declared </option>

<option value= "others" > others </option>

<option value= "small" > small </option>

<option value= "car" > car </option>

<option value= "suv" > suv </option>

</select>

</td>

</tr>

<tr>

<td colspan="2" align="center" ><button class="mybutton" type="submit" name="predict" align='center' value="Predict" >Predict</button></td>

</tr>

</table>

</form>

<table align="center">

<tr>

<td style="font-size:23px" colspan="2"><b>{{ypred}}</b></td>

</tr>

</table>

<br>

<br>

</div>

</body>

</html>

**Python code: app.py**

import pandas as pd

import numpy as np

from flask import Flask, render\_template, Response, request

import pickle

from sklearn.preprocessing import LabelEncoder

import pickle

app = Flask(\_\_name\_\_)

filename = 'resale\_model.pkl'

model\_rand = pickle.load(open(filename, 'rb'))

@app.route('/')

def index():

return render\_template('resaleintro.html')

@app.route('/predict')

def predict():

return render\_template('resalepredict.html')

@app.route('/y\_predict', methods=['GET','POST'])

def y\_predict():

regyear = int(request.form['regyear'])

powerps = float(request.form['powerps'])

kms = float(request.form['kms'])

regmonth = int(request.form.get('regmonth'))

gearbox = request.form['gearbox']

damage = request.form['dam']

model = request.form.get('modeltype')

brand = request.form.get('brand')

fuelType = request.form.get('fuel')

vehicletype = request.form.get('vehicletype')

new\_row = {'yearOfRegistration':regyear, 'powerPS':powerps, 'kilometer':kms,

'monthOfRegistration':regmonth, 'gearbox':gearbox, 'notRepairedDamage':damage,

'model':model, 'brand':brand, 'fuelType':fuelType,

'vehicleType':vehicletype}

print(new\_row)

new\_df = pd.DataFrame(columns =['vehicleType', 'yearOfRegistration', 'gearbox',

'powerPS', 'model', 'kilometer', 'monthOfRegistration', 'fuelType',

'brand', 'notRepairedDamage'] )

new\_df = new\_df.append(new\_row,ignore\_index = True)

labels = ['gearbox', 'notRepairedDamage', 'model', 'brand', 'fuelType', 'vehicleType']

mapper = {}

for i in labels:

mapper[i] = LabelEncoder()

mapper[i].classes\_ = np.load(str('classes'+i+'.npy'),allow\_pickle=True)

tr = mapper[i].fit\_transform(new\_df[i])

new\_df.loc[:, i + '\_labels'] = pd.Series(tr, index=new\_df.index)

labeled = new\_df[ ['yearOfRegistration'

,'powerPS'

,'kilometer'

,'monthOfRegistration'

]

+ [x+'\_labels' for x in labels]]

X = labeled.values

print(X)

y\_prediction = model\_rand.predict(X)

print(y\_prediction)

return render\_template('resalepredict.html',ypred = 'The resale value predicted is {:.2f}$'.format(y\_prediction[0]))

if \_\_name\_\_ == '\_\_main\_\_':

app.run(host='localhost', debug=True, threaded=False)